Creatine Monohydrate

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Overview

- what
- who and why
- how
- when
- why not
- conclusions
- summary/questions

What is Creatine?

- Creatine Monophosphate
  - intracellular protein
  - 95% within skeletal (voluntary) muscle
  - contains phosphate group
  - most readily available source of energy for voluntary muscles

Who is taking creatine and why?

- Who
  - professional athletes
  - other professions - inc. pilots
  - amateur bodybuilders
- Why
  - strength, speed
  - size - “curls for the girls”
  - g tol

How does it work?

- skeletal muscle cell
  - uses 100 times more energy at exercise
  than at rest
  - ATP levels do not change
- Classic Theory of Muscle Fatigue
  - ATP generating processes limit performance

How does it work?

- High intensity exercise
  - anaerobic (no oxygen required)
  - creatine phosphate donates its phosphate group to generate ATP
  - creatine phosphate rapidly depleted (10-20 secs of max high-intensity exercise)

How does it work?

- Peak power output is related to the rate of creatine phosphate breakdown

  - can only sustain peak power output for 5 secs since rate then decreases

  - peak output restored when creatine phosphate stores restored

How does it work?

- Creatine loading

  - increases total skeletal muscle creatine by 20-50%

  - 20% of this is creatine phosphate

- Therefore,

  - more pre-exercise phosphocreatine

  - faster resynthesis of PCr after exercise

When is creatine effective?

- Creatine does not improve tolerance of endurance exercise.
- Creatine does not improve tolerance of single bout of high intensity exercise.
- Creatine does improve ability to perform maximal intensity intermittent exercise.

When is creatine effective?

- Three specific effects
  - increased isometric force
  - increased isometric endurance
  - increased muscle size
    - higher water content
    - higher muscle protein content

When and how much?

- Creatine Loading

  - 20 gms/day for 5-6 days

  (0.3 gms/kg/day)

  - usually in 5 gm doses 4 times each day

  - will achieve the 20-30% increase in total muscle creatine necessary for performance enhancement

When and how much?

- Creatine Maintenance

  - 3 gms/day (0.03 gms/kg/day)

  - maintains the 20-30% increase in total muscle creatine

  - levels of skeletal muscle creatine return to normal within 2-4 weeks after oral supplementation ceases

Why not take supplemental creatine?

- Conflicting results
  - individual variability?
  - unknown factors?
    - Caffeine inhibits effects of supplemental creatine

Why not take supplemental creatine?

- Longterm side effects unexplored

  - Creatine depletion causes mitochondrial/cell wall defects and muscle fiber disruptions.

  - Creatine excess causes ?

Conclusions

- Creatine is a skeletal muscle protein
- Creatine rapidly generates ATP(energy)
- Creatine supplementation increases muscle mass and isometric exercise performance
- Creatine load: 20 g/day for 5-6 days
- Creatine maint: 3 g/day
- Long term side effects of creatine supplementation are unknown.

Questions?